

Ceramic Inlays

A simple & reliable method



At the dawn of a new generation of CAD/CAM made all-ceramic prosthetics it seemed appropriate to pass on the knowledge I've obtained from making several thousands of ceramic inlays.

This article is about a simple method that proved its mettle as much where aesthetics as where precision fit were concerned. Improvement has been a continual process over the years and today, this method guarantees 100% stress-free success!

Something that couldn't have been further than the truth 15 years ago when the dentists I was working with asked me to make my first inlays...

But as every problem finds a solution, here are a few snapshots that captured the smooth running of my work procedures.

FROM AERONAUTICS TO PROSTHETICS!

As a follower and fan of aeronautics, it amuses me to compare inlays and ceramic veneers that are made via the same process that is used for aircraft construction, where precision is necessary, and one mistake can be fatal.

In addition to carrying out a technical case I will be providing you with a parachute, as a bonus to be used in the worst case scenario.

Close collaboration between dentists and technicians is the *sine qua non* condition of the success of this type of work. With my colleagues Doctors Pierre & Christophe Raygot we tried to understand the reasons for some of our first failures that we resolved together, as everything evidently, depends on preparation and tooth size, which must meet specific criteria.

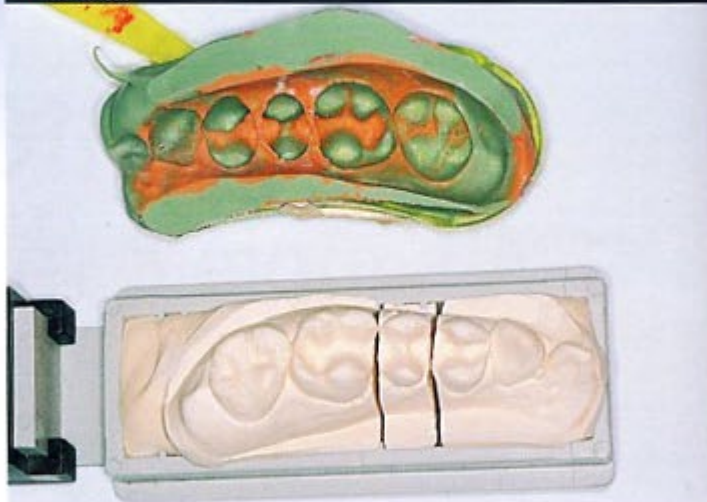
- 1- A too narrow occlusal passage between two cavities on an (MOD) mesial occlusal distal inlay is sure to cause a medial fracture at the final firing.
- 2- Angles that are too acute in the preparation generate fracture-prone areas.
- 3- In the same way, bevelled edges in the preparation create fragile areas.

When putting together this article, the pictures had priority over the text, considering images speak louder than words!

Besides, as with film, it is easier to understand a succession of steps in a didactical manner without having to read between the lines to follow the elaboration of the work.

I also consider that a professional article should be able to be taken in quickly and in a reader friendly way, as from experience the time spent on it is actually very short.

1 Impression that was already used for the master model being prepared and trimmed.



2 Occlusal appointment of the opposing models.



I'M GETTING REQUESTS FOR CERAMIC INLAYS...

From where I'm standing people are telling me:

"What's the use in producing ceramic inlays while composite is much easier to work with for a similar result!"

The simple reason "for" ceramic inlays is that my dentists do not want to know about composite inlays, and are champing at the bit with arguments backed up by sound sources and proof that the latter undergo variations in volume every time

they come into contact with heat, thus, we are unable to guarantee the desired water-tightness for the bond between the composite and the tooth!

In fact a number of publications have been produced on the subject and I recommend that you get hold of them if you're interested in ceramic inlays.

I'm still getting orders for ceramic inlays, so naturally to this day I'm still producing them!!!

PROCESS

Model Preparation

Impression reception and decontamination.

Processing the impression, plaster cast, separation of preparations (Fig. 1).

Precision placing of the case in the articulator (Fig. 2)

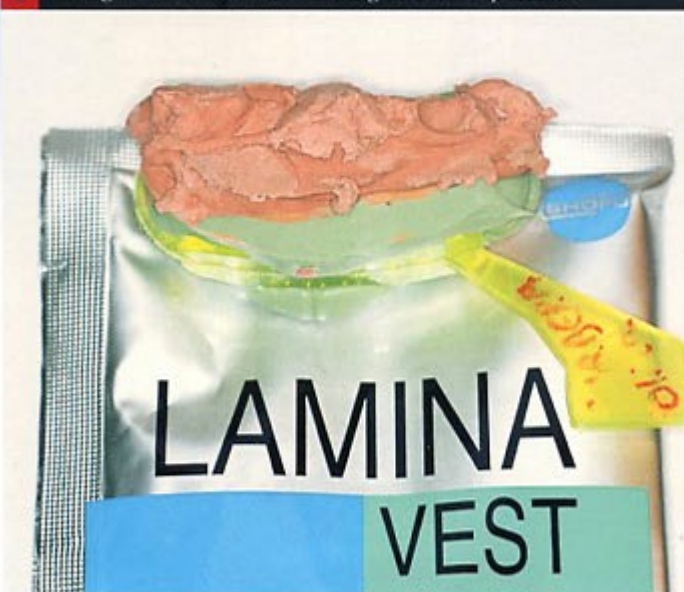
courtesy of the Twin Tray articulator from DVA (this can also be done without removing the impression).

Refractory Model Preparation

The investment is poured into the same impression if it has not been torn during removal!

In the event of deterioration, which is very rare (occurring in barely 5 % of cases), I duplicate the model in plaster by

3 Casting the investment material using the same impression.



4 Preparing the retention grooves.



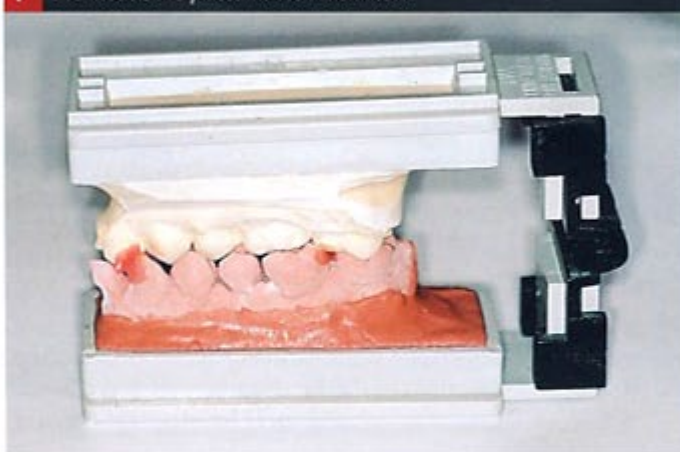
5 Setting the investment and the plaster model.



6 Aerial view.



7 The models are placed in the articulator.



using a silicone impression in which I will pour an 'investment mix': I substitute the quantity of liquid recommended by the manufacturer with a third of de-mineralised water, which aims to compensate for the expansion that has resulted from the first cast, which acts as a guide (Fig. 3).

1 hour after removal of the investment model, I arrange the retention grooves in preparation for placing the

investment model on the articulator (Fig. 4).

The antagonist model is set in investment, using the previously cast plaster model as a guide (Fig. 5).

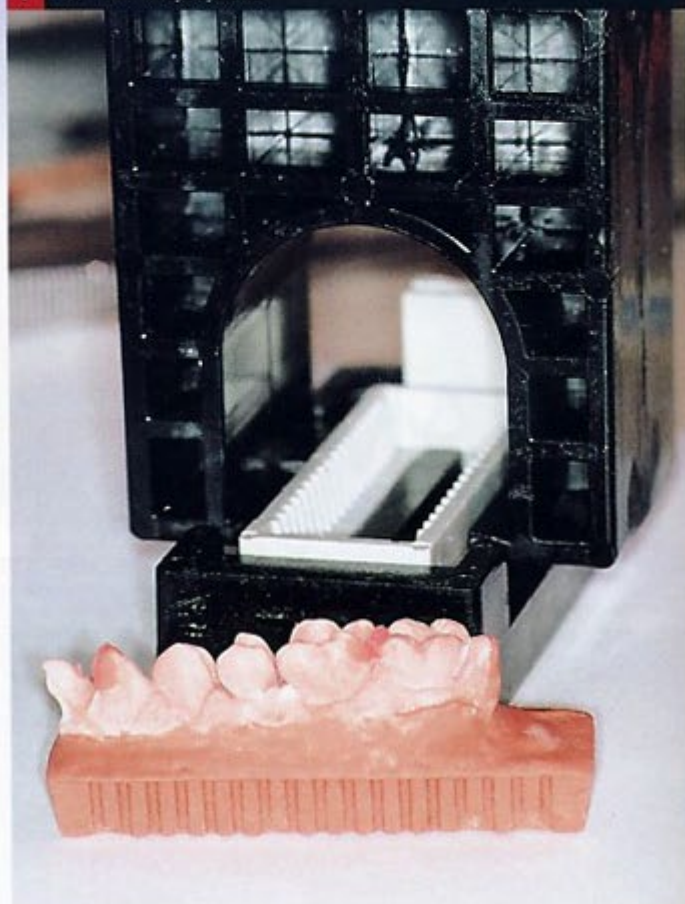
Aerial view of the situation (Fig. 6).

The investment model is placed in the articulator after the wax has hardened (Fig. 7).

8 Refractory model after drying.



9 The Twin Trays system.



10 10 minute dehydration at 1000°.



11 Immersion during 20 minutes.



The investment model is recovered for the next step after drying (Fig. 8).

Working with the Twin Trays system (Fig. 9). Pre-dehydrating the model according to the manufacturer's instructions, i.e.; for 20 minutes heated at 600° in a heating oven. The investment model undergoes the next heat dehydrating cycle for 10 minutes at 1000° in the ceramic furnace (Fig. 10).

After the model has cooled it is immersed in demineralised water for 20 minutes (Fig. 11).

Then we end up with an identical copy of the plaster model once the preparations have been trimmed. Now that our investment model is thoroughly saturated with water we can make a start on our ceramic build-up.

I obviously use the same brand ceramic powders as my investment material for compatibility reasons.

12 Condensation with a vibrating tool and a tissue...



13 ...as many time it takes until the water stops rising.



14 First firing.



15 Now we apply the more orange opaque dentine.



16 2nd firing.



Fine layer Build-Up Technique

Application of the first fine layer of ceramic, opaque dentine for the core of the cavity.

Maximum manual condensation, which consists of using a vibrating tool, then successively drying the preparation with a tissue paper as many times as necessary as the water rises to the surface as a result of capillarity (Figs. 12 & 13).

First firing: All firings are conducted on the same programme: 10 minutes drying, oven pre-heated to 650°,

the temperature will rise for 6 minutes until it reaches 925°, and is held for 1 minute instead of a few seconds as recommended by the manufacturer. Stabilising the temperature is important as it allows the heat to spread throughout the ceramic, which is thermally isolated by the investment material (Fig. 14).

Second application of the opaque+orange dentine powders in the core of the grooves, and carry out maximum condensation once again (Fig. 15).

Second firing: The inlay's success is down to the build-up in small successive layers whilst going easy on the amount of ceramic that is applied at each firing. Too great a quantity of ceramic would cause cracks that would be beyond recovery, thus not enabling good homogeneity of the end product (Fig. 16).

CLINICAL POINTERS FOR SEATING

First and foremost it is essential to carry out the cementing operation using a wall-like barrier.

First off, we conduct polishing with a pumice stone on the fit surface of the preparation with a small brush to obtain good surface condition.

Then the preparation undergoes etching with acid.

After it has been rinsed and dried a layer of Aquaprep (BISICO) is applied, then a coat of One Step (same brand) prior to application of the cementing composite, Dual Choice.

The inlay is inserted in the cavity, then light-cured four times for 20 seconds.

N.B. Occlusal appointment must be conducted after cementing to avoid fracturing unsupported areas.

Doctors Pierre & Christophe Raygot

Recommended reading:

"Adhesion: The Silent Revolution"

By J.F.Roulet & Michel Degrange - *QUINTESSENCE PUBLISHING*

17 *Incisal & transparent dentine.*



Third application: once again in fine layers, this time adding dentine, incisal and transparent powders (Fig. 17). Viewing the third firing (Fig. 18).

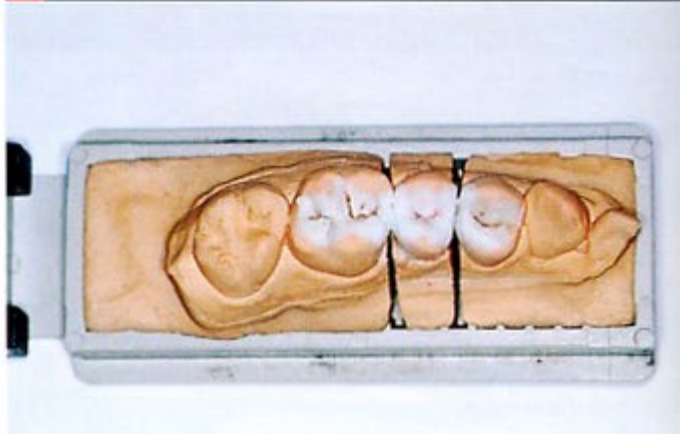
Fourth application: This time only incisal, occlusal and transparent are applied according to the shade you wish to obtain. Personally, I take shades straight from the patient's mouth (Fig. 19).

Depending on the thickness of the inlay, a fifth or a even a sixth firing could be necessary before concluding with glazing.

18 *Third firing.*



19 *Occlusal & transparent incisal application for fourth firing.*



20 *Transferral of the inlays onto the plaster model.*



Checking and inlay finishing stages

To separate ceramic from the investment material I trim the preparation with a diamond bur to finish up with micro pearl sandblasting (small glass marble beads which do not attack the ceramic). I then transfer the inlays onto the plaster model, delicately lowering them to get rid of any odd undercuts. Then all that is left is verification of the occlusal contacts and occlusion (Fig. 20).

Then comes the etching phase where I protect occlusal surfaces with wax before immersing in an acid solution for

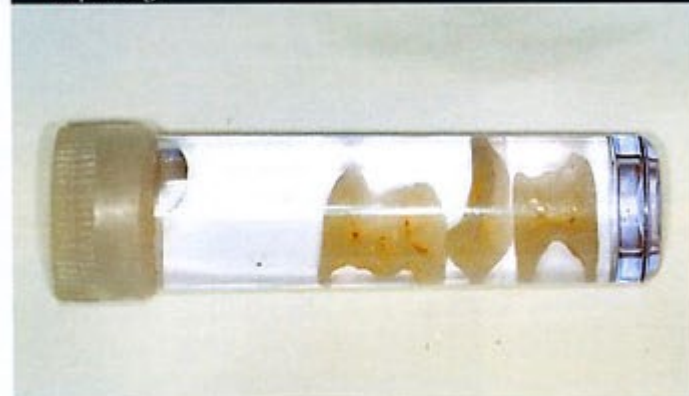
21 Etching (whilst protecting occlusal surfaces).



22 After the ultra-sound cleaning process with chloroform liquid.



23 Inlays are stored and protected in water-filled plastic tubes for dispatching.



1-2 minutes. The only point in using metal posts is for when we take the inlays out of the acid (Fig. 21).

After rinsing, in order to perfectly clean and remove all wax residue from the inlays, I recommend that they be put in chloroform liquid, with an ultra-sound treatment for several minutes (Fig. 22).

I never leave inlays on the model, I store them in water inside airtight plastic tubes (not glass) to avoid any shock and that is how they are delivered (Fig. 23).

About the Author



Ghislain Fournier is one of our fellow dental technician's who is lucky enough to work "in vivo" in a dental practice where his role is recognised and his skills are respected. This is how Ghislain, at forty acquired a broad experience by dealing with patients.

Having obtained a "brevet de maitrise" vocational qualification (awarded after 2 years of study and or 3 years of work experience) in 1987 after training at laboratoire Martini in Sens he had the chance to do his military service as a dental technician.

Ghislain discovered the world of dental technology at a young age as his elder sister married a dental technician, and made frequent visits to his lab to make accessories for small cars, electric train set, etc.

He made his debut working with Pr Marois (Dentistry department manager at the American Hospital in Neuilly on the outskirts of Paris) as laboratory manager.

Today he works at the Institut François, a dental practice, which is run by Dr P. & C. Raygot specialising in aesthetic dentistry.

He is also a founding member of European Aero Dental Club.



Founding Member of European Aero Dental Club

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24 Inlays once seated - you can hardly spot them!



Inlays once seated.

On this case you can tell which are the inlays, however in 80 % of cases they are completely invisible (Fig. 24). ♦

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